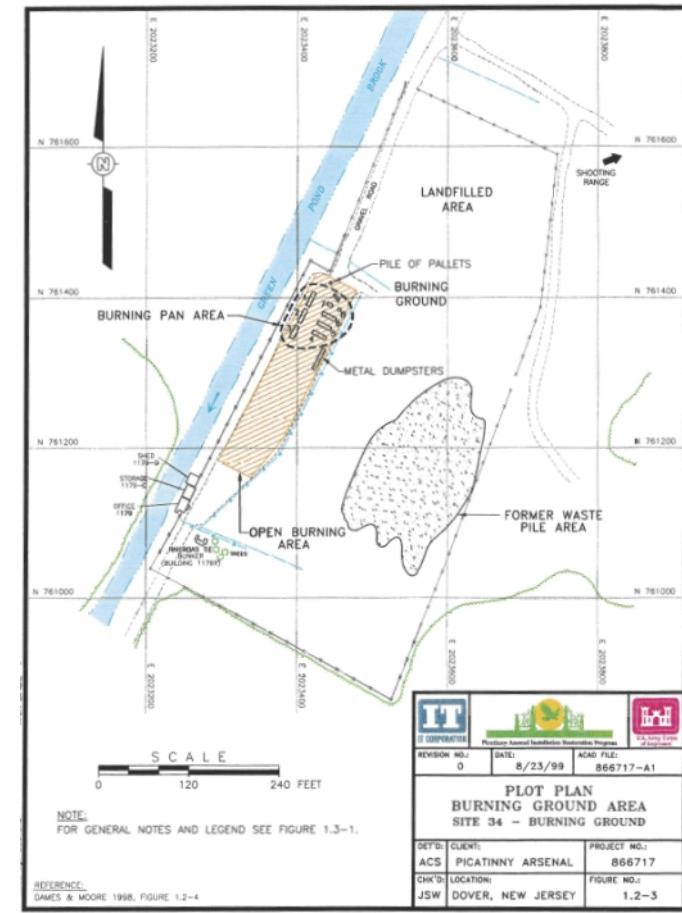
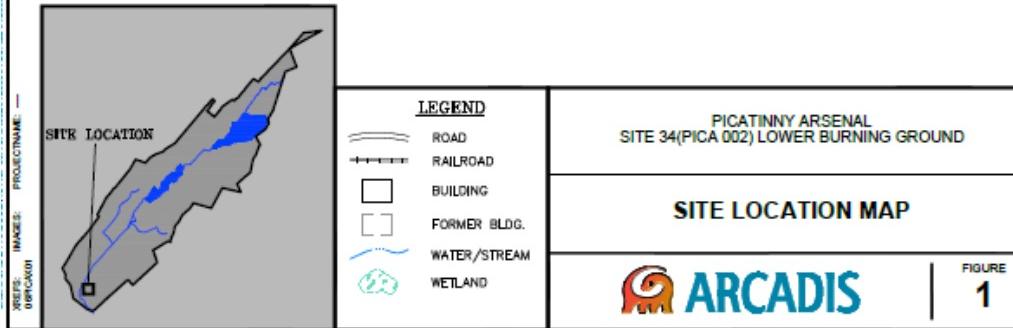
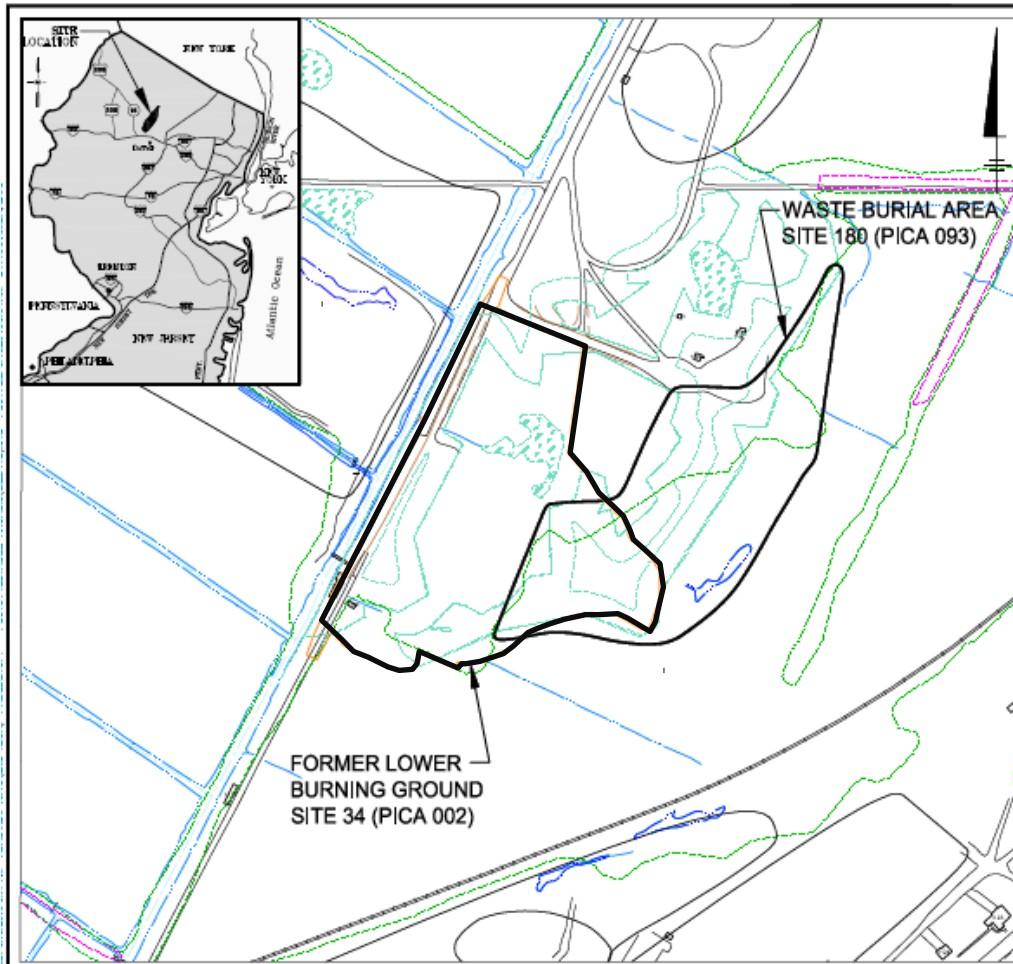




Former Lower Burning Ground RAB Presentation

October 24, 2013





- Operational in 1960
- Open burning discontinued in 1985
- Burn pans operated until 2011



Contaminants of Concern (COCs)



Surface Soil COCs: Polycyclic aromatic hydrocarbons (PAHs) (5), metals (arsenic, cadmium, copper, and lead), Polychlorinated Biphenyls (PCBs), and dioxins/furans

Subsurface Soil COCs: PAHs (4) and dioxins/furans

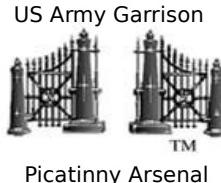
Groundwater COCs: None

- Metals have the highest potential for leaching to groundwater
- An impact to groundwater study found lead was the only constituent identified within site soils as having the potential to be an existing continued source to impact groundwater



CERCLA Program

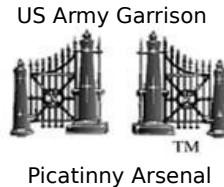
Where Are We?



- ✓ Remedial Investigation – 1998
- ✓ Feasibility Study – 2001
 - 1. Additional soil/groundwater samples – 1999, 2003, 2009, & 2010
- ✓ Proposed Plan – 2004 (Public Meeting February 19, 2004)
- ✓ Record of Decision Signed in 2005
 - 1. Selected Remedy is asphalt cover, LTM of groundwater, and LUCs
- ✓ Procurement for Design to Current Standards – June 2013
- ✓ Draft Remedial Design/Explanation of Significant Differences – Sept 2013

Remedial Design and Remedial Action are currently ongoing

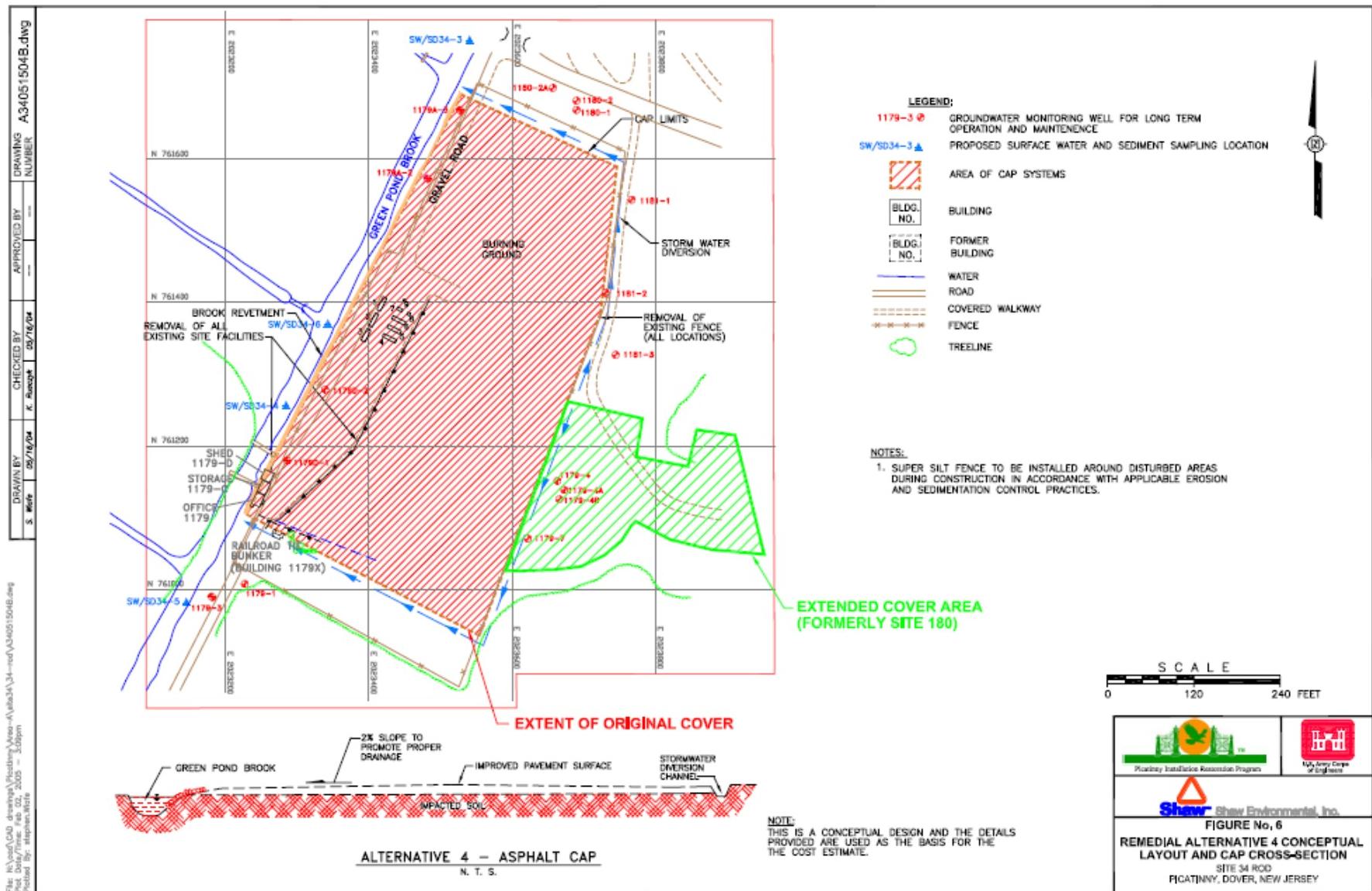
- 1. One monitoring well installed sampled – 2009/2010
- 2. Phase 1 Complete - Trees and surface MEC cleared from site March 2012
- 3. Phase 2 Ongoing – Currently developing the Remedial Design
- 4. Phase 2 complete by July 30, 2014



Remedial Action Phase 2

Summary of Major Components

Figure of Selected Remedy in ROD





Current Remedial Design



Developed Remedial Design (RD) to include asphalt cover and a hybrid capping approach (similar to DRMO)

Design includes a 2 acre asphalt and 6 acre soil cap in lieu of 7 acres of asphalt

- 2 acre asphalt over most contaminated soils
- Same LUCs
- Same LTM for GW (7 wells in unconfined aquifer and 2 wells in lower semi-confined aquifer)

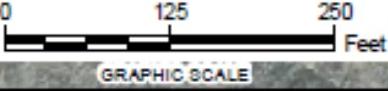
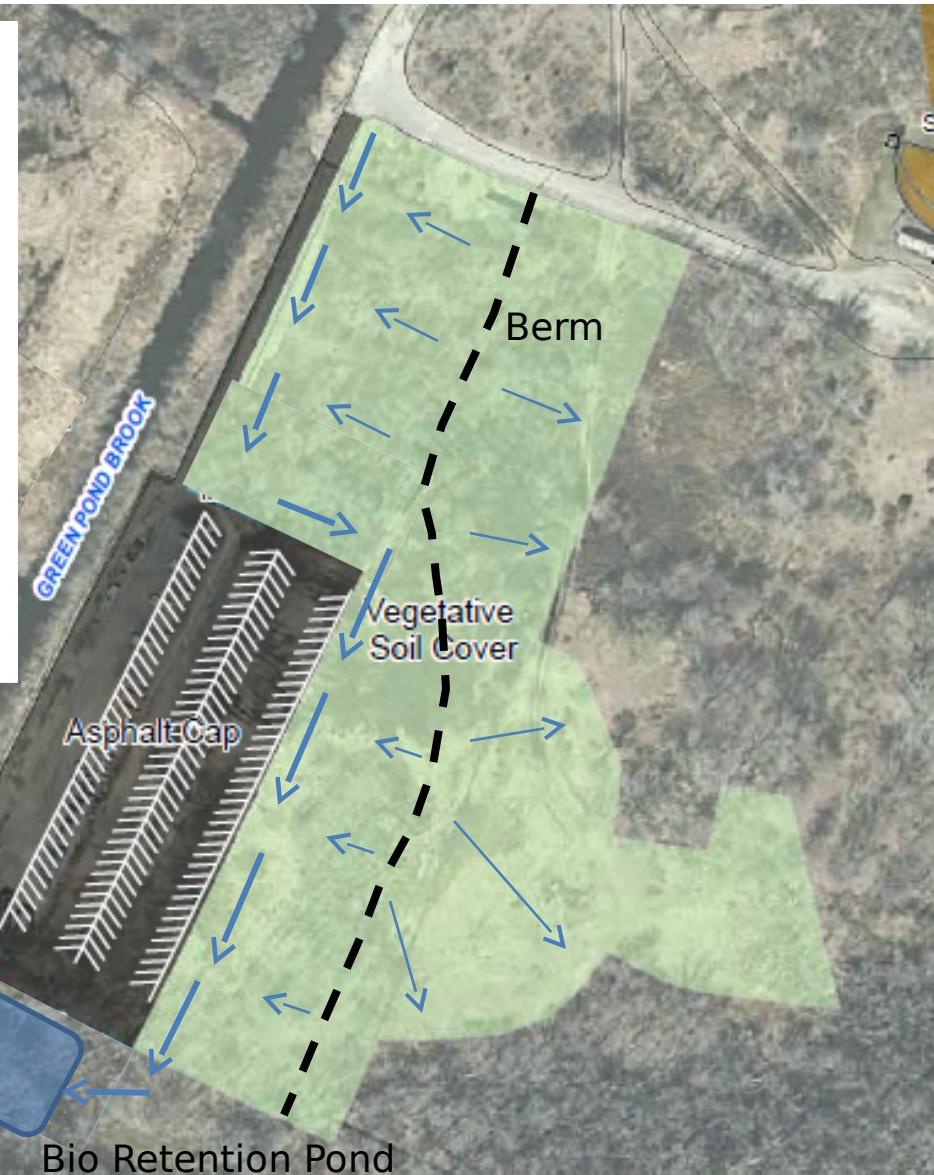
Limits impermeable surface providing a better remedy for the environment

Asphalt Cap:

1. Caps most contaminated area
2. Caps 11 highest lead concentrations
3. Caps the highest dioxin/furan concentration
4. Located next to (and upgradient of) the 3 wells with MCL exceedances

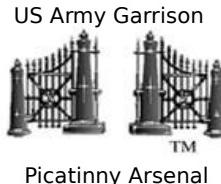
<u>Asphalt Cap</u>	<u>Soil Cover</u>
Max. lead conc.	15,800
Ave. lead conc.	2,405

Concentrations in mg/kg (ppm)





CERCLA Documentation?



USEPA and NJDEP approve of this approach
and will review RD in November 2013

An Explanation of Significant Differences
(ESD) was prepared to:

1. Describe the changes;
2. Summarize the information that led to the changes;
3. Affirm the revised remedy complies with the NCP and CERCLA

Public notice is required



Remedial Action Components



1. Vegetation Clearing (90% complete)
2. Removal of Debris and Buildings
3. Install Cap (Soil Cover and Asphalt Cap)
4. Mitigate Wetland Loss
5. Long Term Monitoring, Maintenance, and Land Use Controls



90% complete

- Re-cut brush that has re-established
- Remove trees in area of bio-retention pond



Photos: Lower Burning Ground 2012



Remedial Action Components



1. Vegetation Clearing (90% complete)
2. Removal of Debris and Buildings
3. Install Cap (Soil Cover and Asphalt Cap)
4. Mitigate Wetland Loss
5. Long Term Monitoring, Maintenance, and Land Use Controls



Remove debris from site to allow capping

- Large surface debris
- Existing buildings
- Remove for off-site disposal



Photos: LBG 2012/2013 (2 photos to left) and debris load out at an ARCADIS/Army project site (photo on right)



Remedial Action Components



1. Vegetation Clearing (90% complete)
2. Removal of Debris and Buildings
3. Install Cap (Soil Cover and Asphalt Cap)
4. Mitigate Wetland Loss
5. Long Term Monitoring, Maintenance, and Land Use Controls



2 Acre Asphalt Cap

- Geotextile fabric
- 12 inch gravel subbase
- 4 inch hot mix asphalt



Photos: DRMO in 2009



6 Acre Soil Cover

- Geotextile fabric
- 18 inch soil cover
- 6 inch topsoil layer



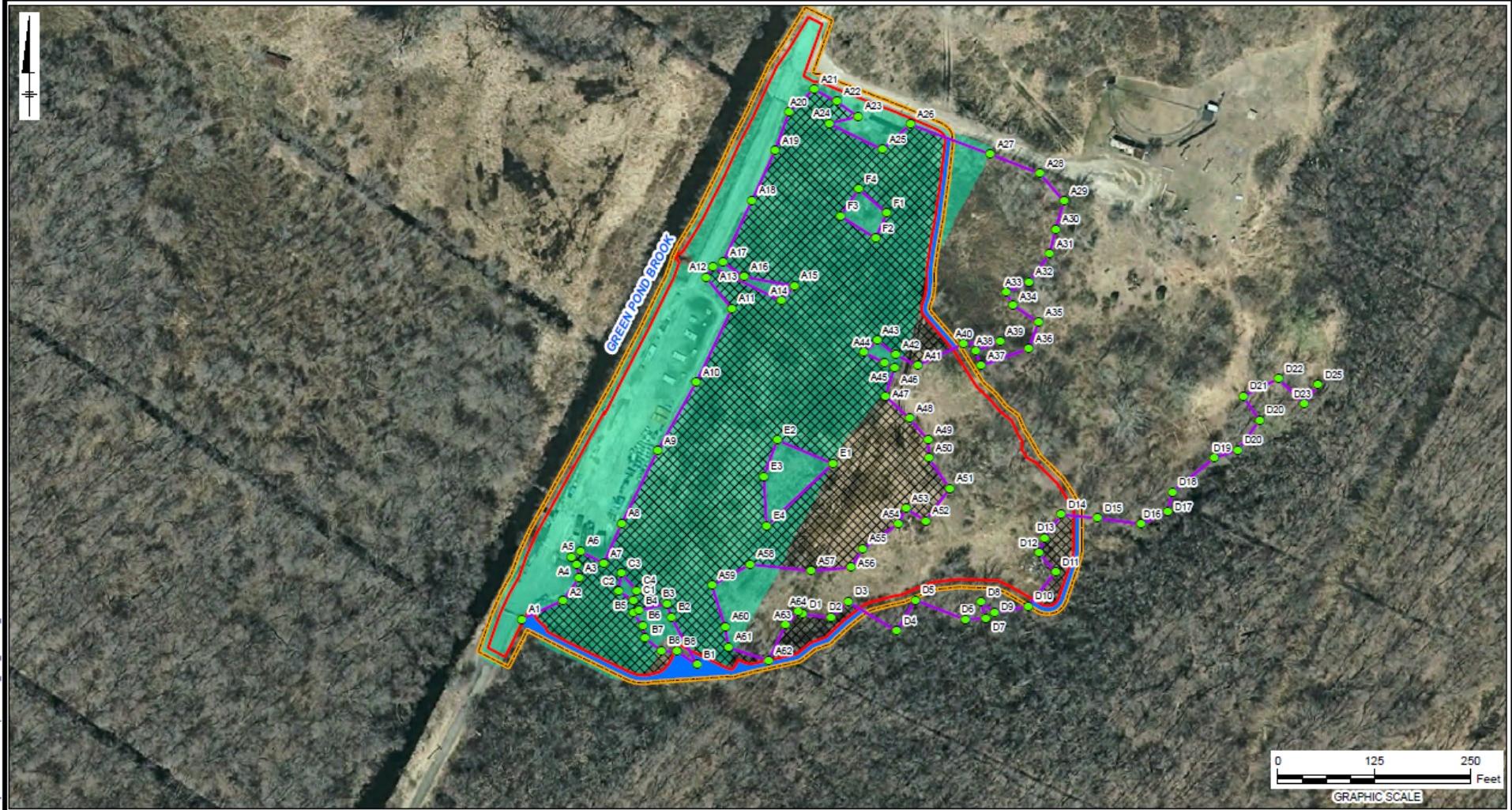
Photos: DRMO in 2009



Remedial Action Components



1. Vegetation Clearing (90% complete)
2. Removal of Debris and Buildings
3. Install Cap (Soil Cover and Asphalt Cap)
4. Mitigate Wetland Loss
5. Long Term Monitoring, Maintenance, and Land Use Controls



PICATINNY ARSENAL, MORRIS COUNTY, NEW JERSEY

NJDEP DLUR PERMIT EQUIVALENCY PACKAGE

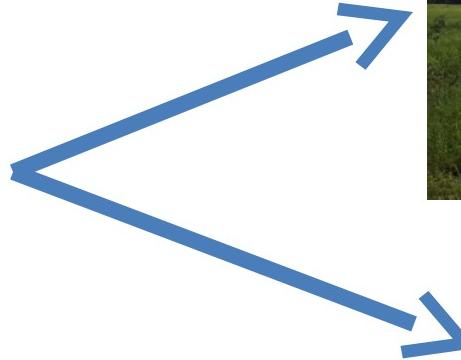
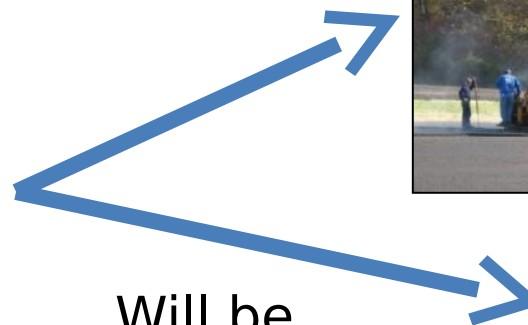
DRAFT

SITE PLAN

ARCADIS

FIGURE
3

What is Mitigation? Why are we doing it?



Mitigation Areas



September 2013



Ground application of herbicide

Winter 2013/2014



Mowing of Dead Phragmites (invasive)



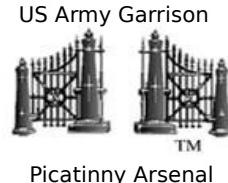
Remedial Action Components



1. Vegetation Clearing (90% complete)
2. Removal of Debris and Buildings
3. Install Cap (Soil Cover and Asphalt Cap)
4. Mitigate Wetland Loss
5. Long Term Monitoring, Maintenance, and Land Use Controls



Long Term Monitoring



Groundwater Sampling: Long term monitoring program for 9 wells consistent with RCRA requirements and other CERCLA LTM programs at Picatinny.

Surface Water Sampling: Long term monitoring program for 2 additional sampling points in Green Pond Brook.

Sediment Sampling: Completed as part of Green Pond Brook Action since 2007.

Land Use Controls:

1. Control excavation at the site;
2. Prevent use of property for residential housing, elementary and secondary schools, childcare facilities and playgrounds;
3. Maintain the integrity of the asphalt cap and soils cover; and
4. Annual Certification to USEPA and NJDEP.



Schedule and Path Ahead



Draft RD and ESD to USEPA and NJDEP in November 2013

Winter Mobilization to remove dead phragmites and clear brush/trees

Public Notice of ESD early 2014

Install cap and complete mitigation April – July 2014

Remedial Action Report – September 2014

Questions?



RAB UPDATE

Mid Valley Groundwater

October 24, 2013





Status of CERCLA Process

- ✓ Remedial Investigation (Characterization of Site)
- ✓ Feasibility Study (Assessment of possible remedies)
- ✓ Proposed Plan (Public document to solicit input on preferred remedy)
- ✓ Record of Decision (Final legal document selecting remedy)
- ✓ Remedial Action (Implement Remedy)
- Long Term Operation, Monitoring and Maintenance



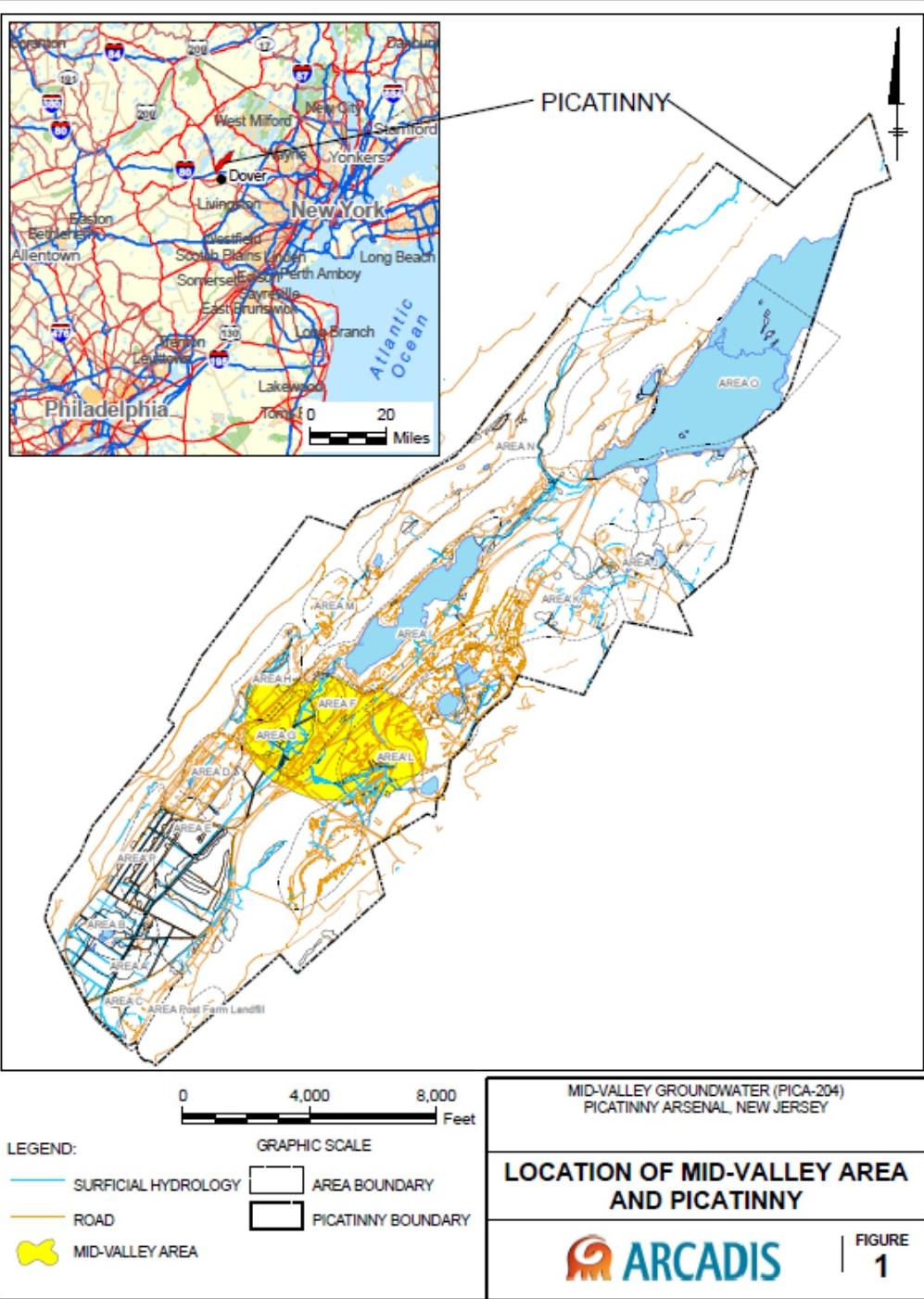
Presentation Agenda



- Update on in-situ bioremediation remedy and review data collected thus far
- Review results of RDX plume soil investigation
- Discuss next steps at Mid Valley

Selected Remedy

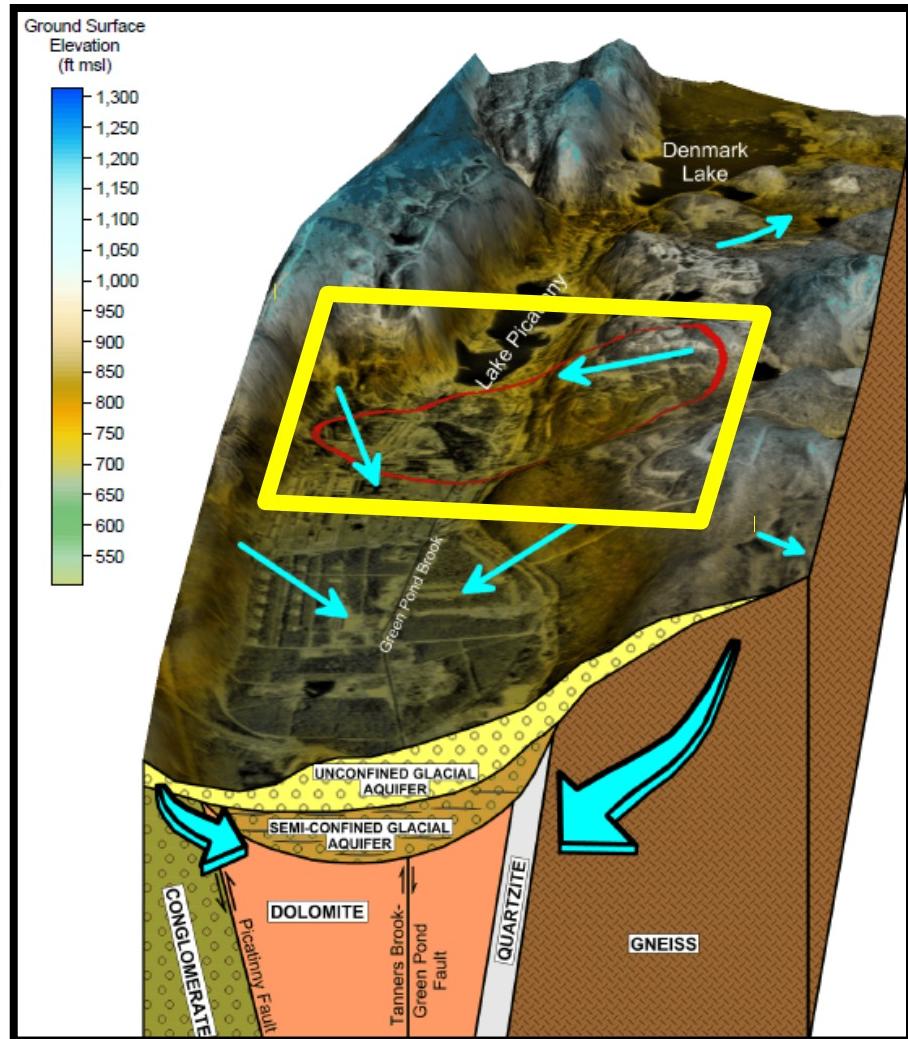
- In-situ bioremediation with MNA for TCE contaminated groundwater
 - Inject emulsified vegetable oil (EVO) into 18 wells at head of plume where concentrations are highest. Achieve remedial goals in 35 years (instead of 190 years)
- MNA for RDX contaminated groundwater
 - Achieve remedial goals in 15 years for the shallow plume and 35 years for the



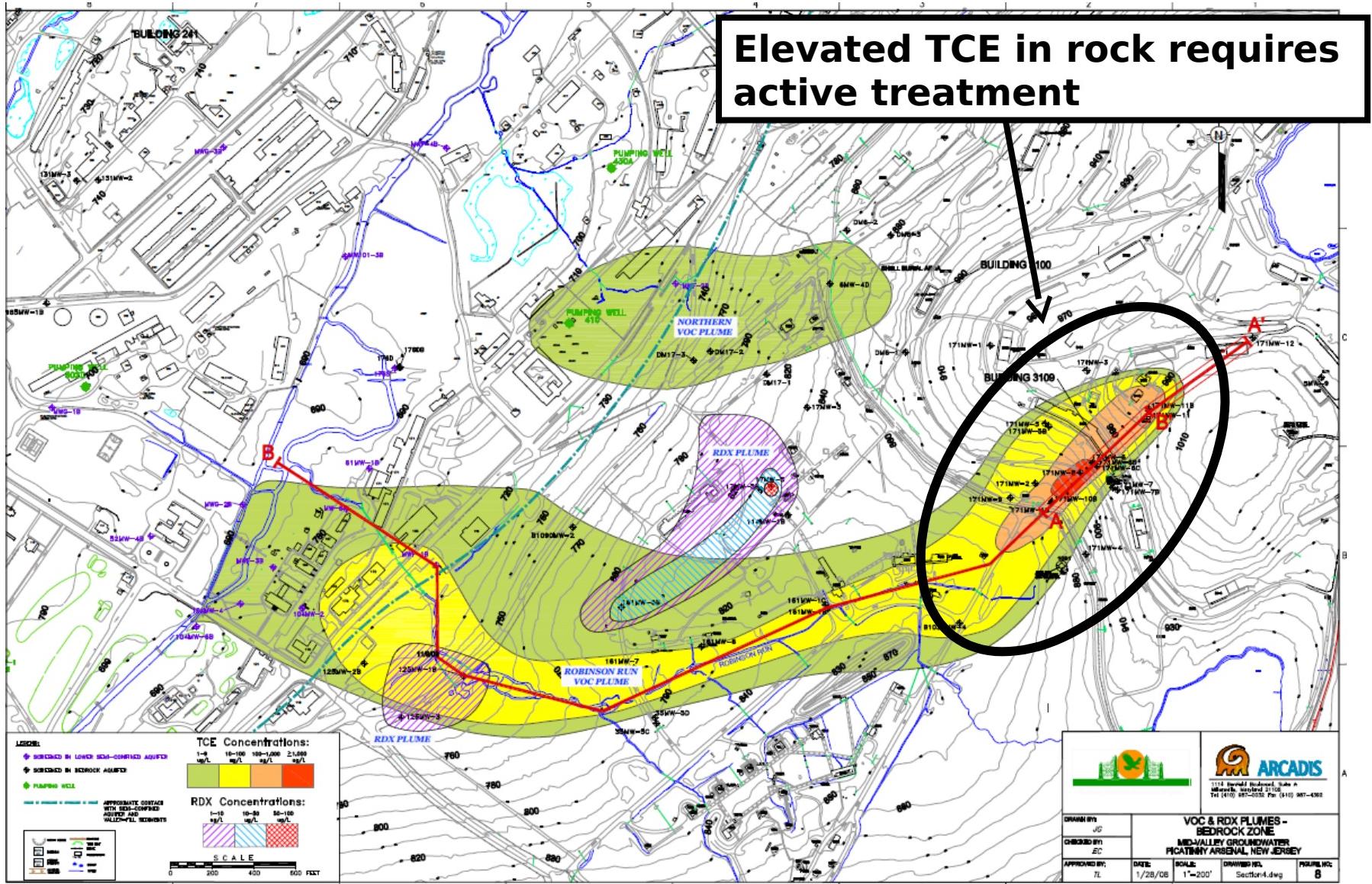
Regional Conceptual Site Model

- Geology

- Glacial valley fill with bedrock uplands
- Surface water bodies present include Robinson Run and Green Pond Brook
- Groundwater flow directions are towards the valley (Green Pond Brook) and locally towards Robinson Run



Deeper Groundwater





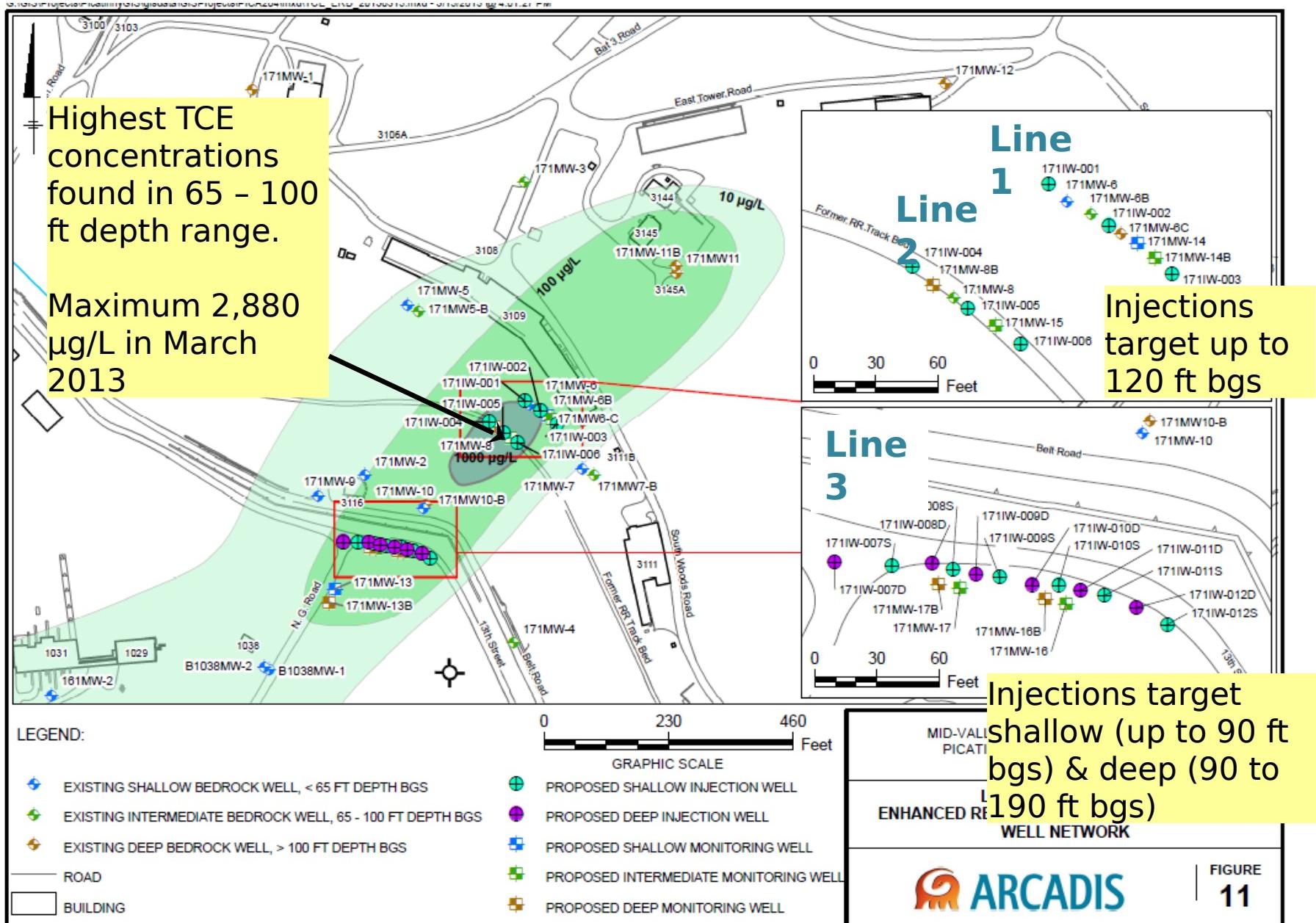
2013 In-Situ Bioremediation Activities

US Army Garrison
Picatinny Arsenal

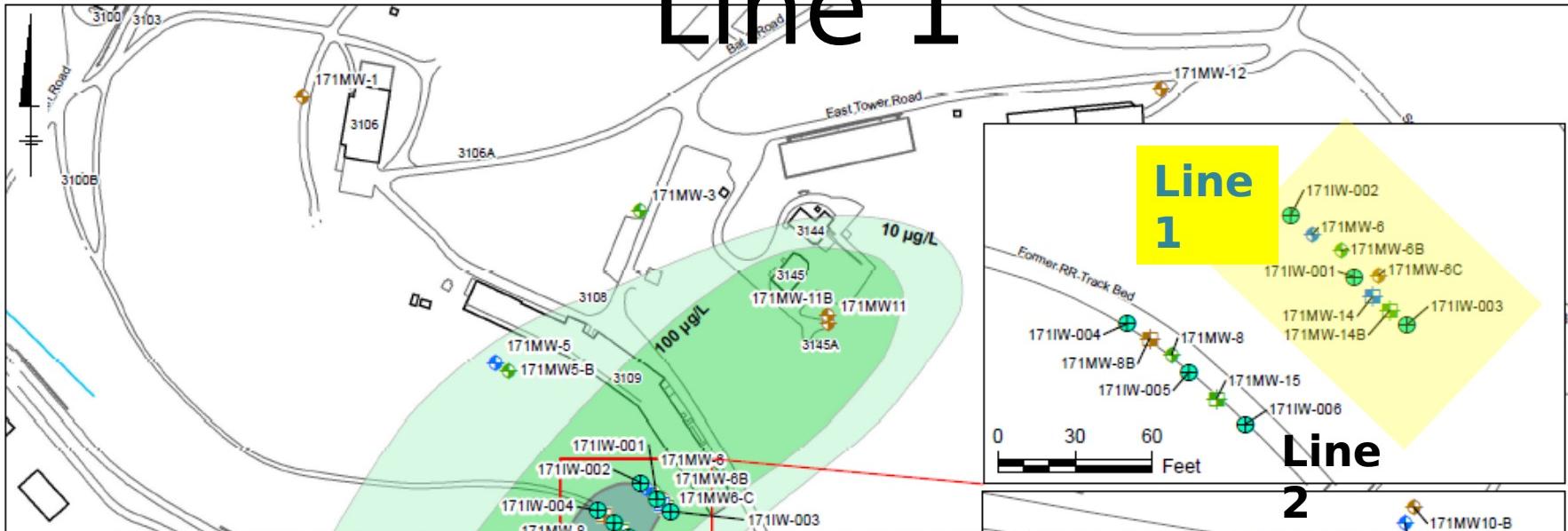
- February – March: Baseline performance monitoring
- March: First EVO injection
- 2 quarterly monitoring events since injection
 - May
 - August
- Already seeing favorable results in several wells
- Next quarterly monitoring event scheduled for November



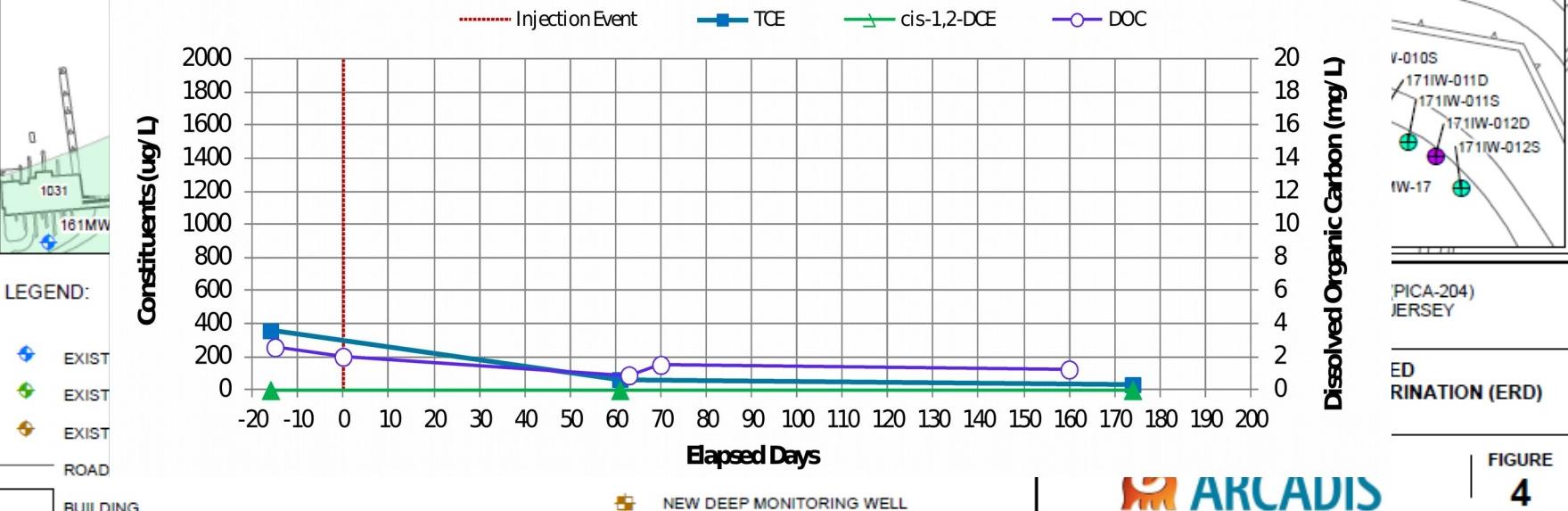
In-Situ Bioremediation



In-Situ Bioremediation - Line 1



171MW-6 (shallow)

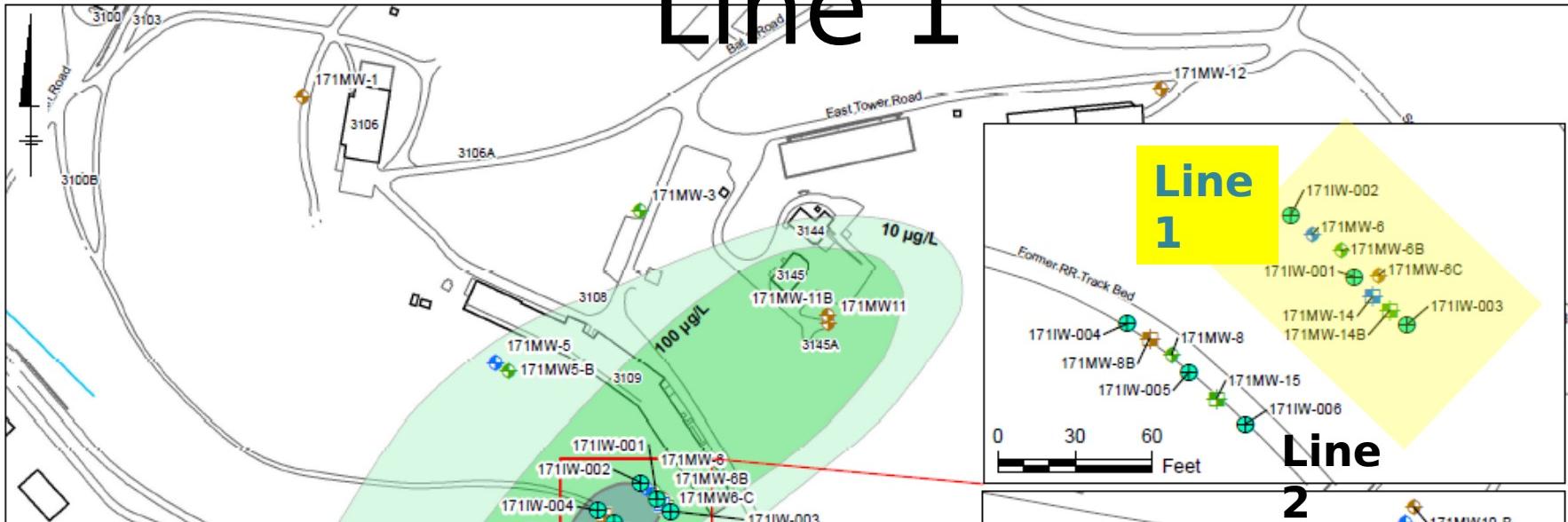


PICA-204
JERSEY

ED
RINATION (ERD)

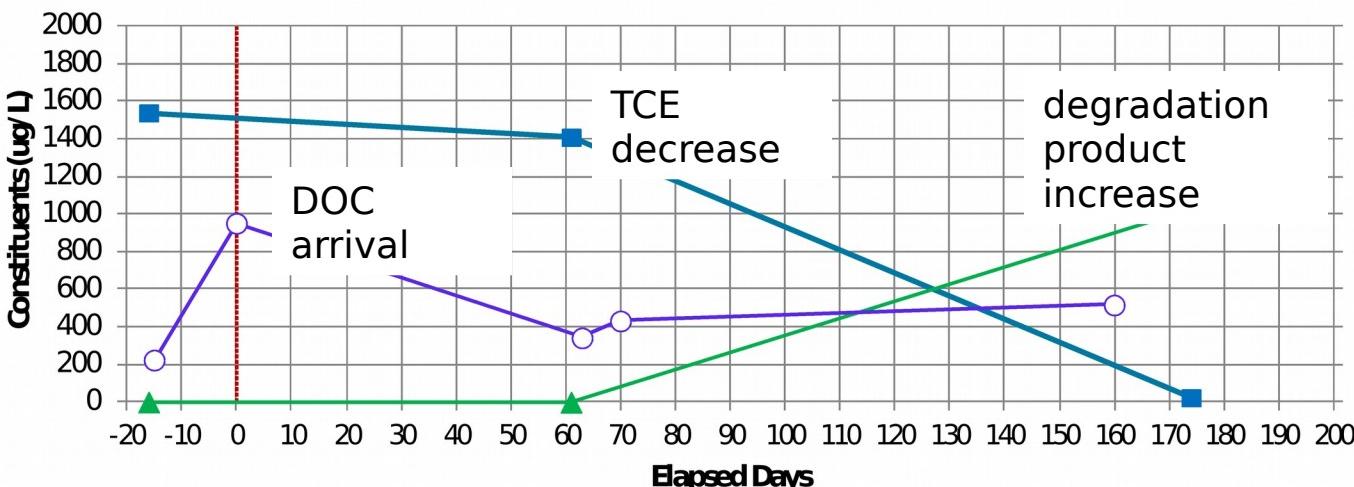
FIGURE
4

In-Situ Bioremediation - Line 1



171MW-6B (intermediate)

----- Injection Event TCE cis-1,2-DCE DOC



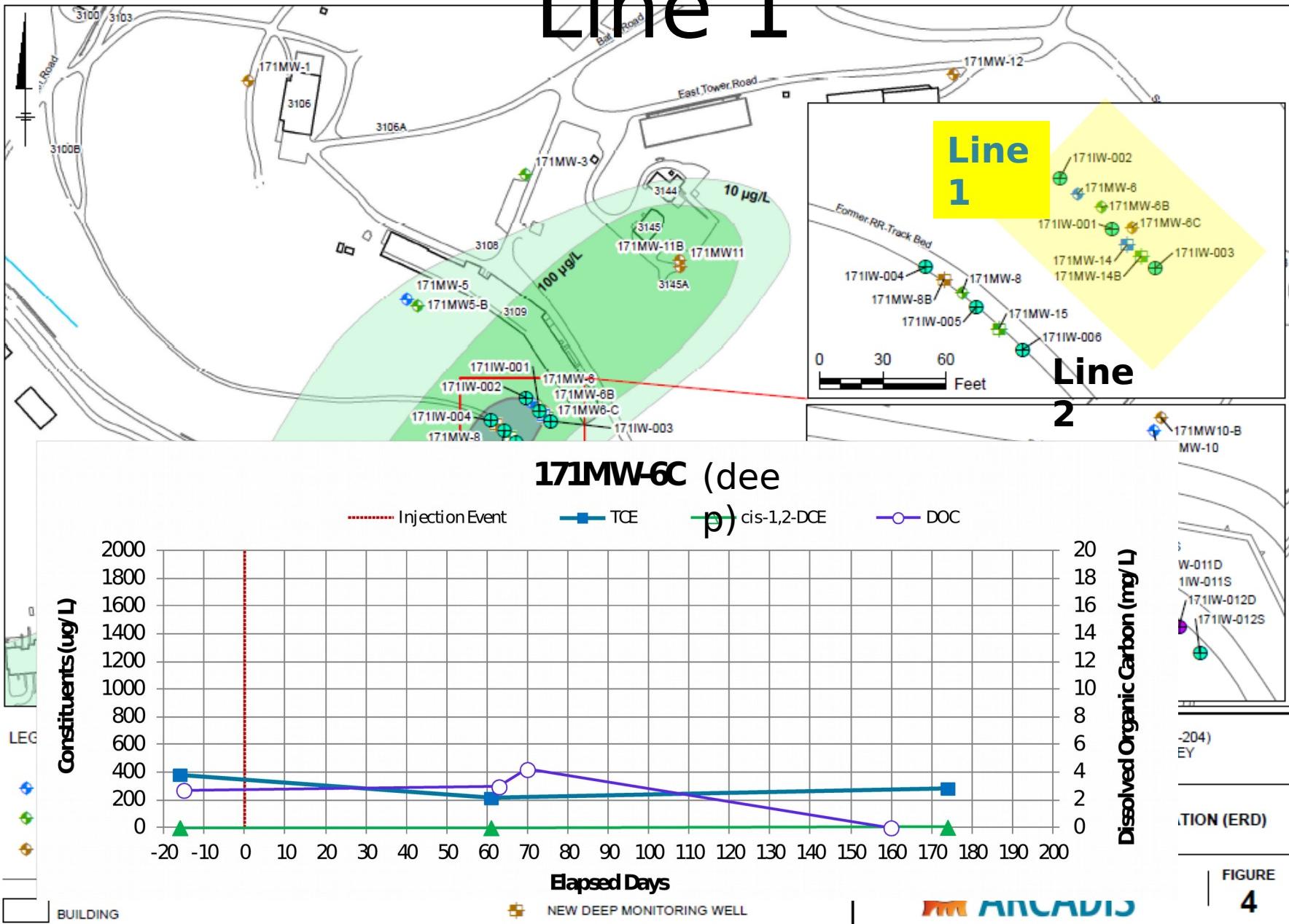
BUILDING

NEW DEEP MONITORING WELL

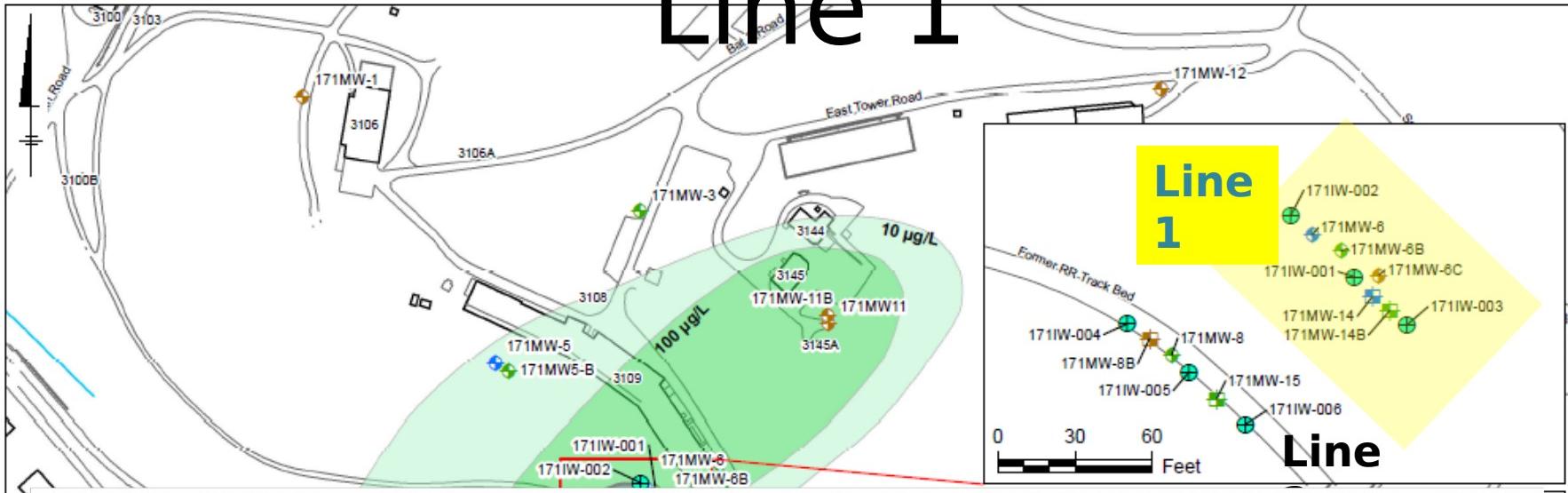
MARVELS

FIGURE
4

In-Situ Bioremediation – Line 1



In-Situ Bioremediation - Line 1



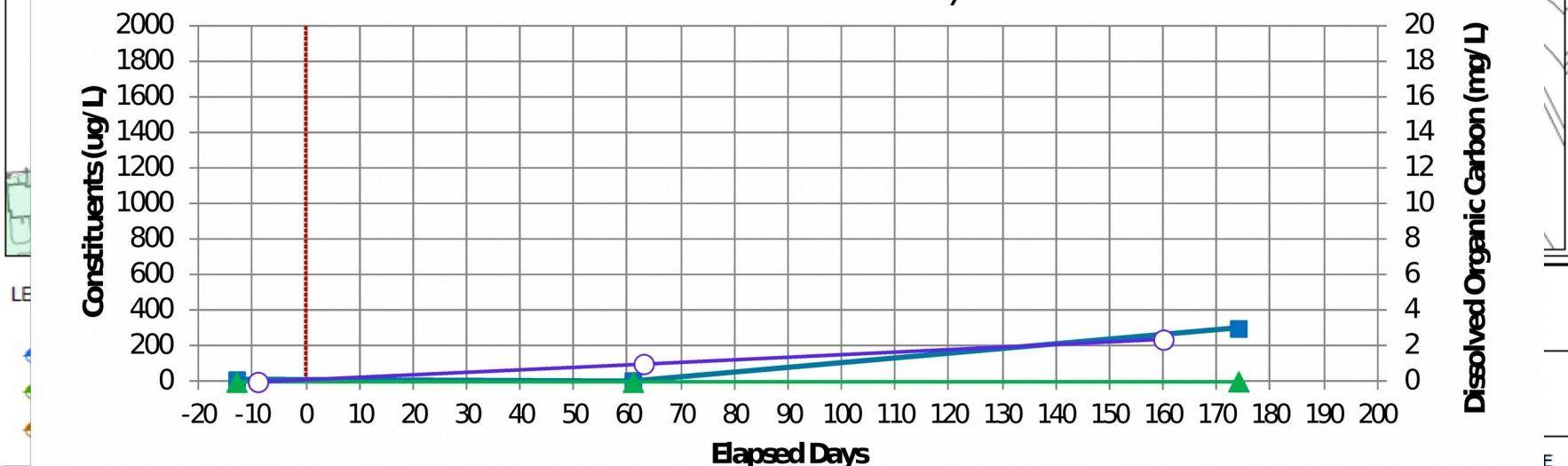
171MW-14 (shallow)

----- Injection Event

— TCE

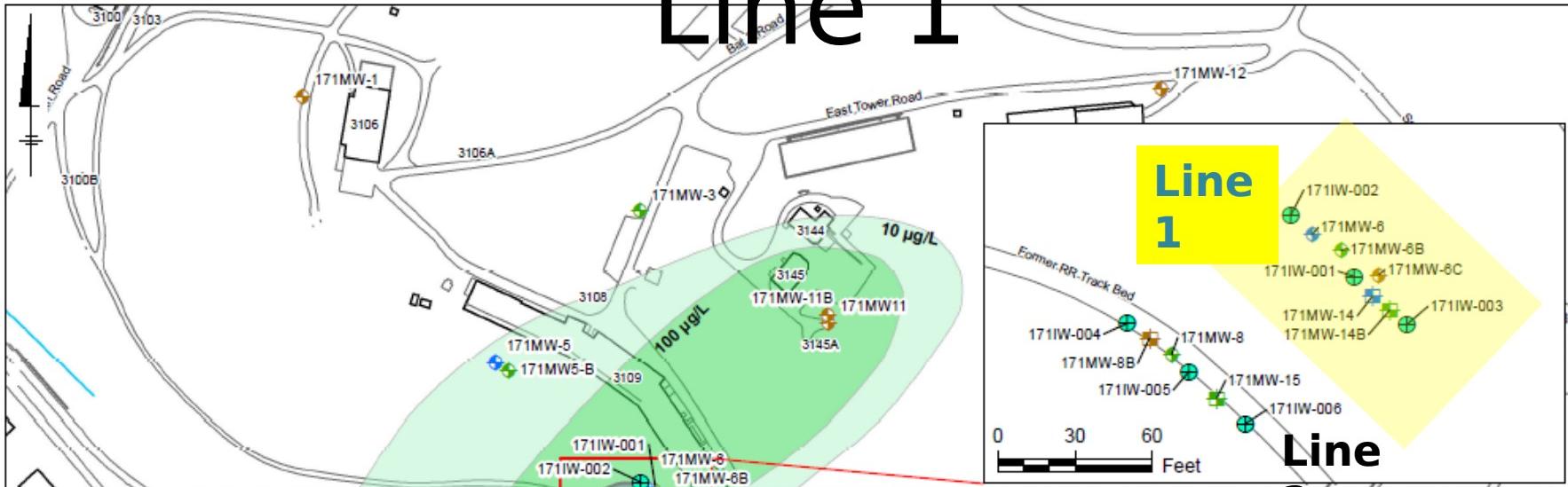
(W) cis-1,2-DCE

— DOC



NEW DEEP MONITORING WELL

In-Situ Bioremediation - Line 1



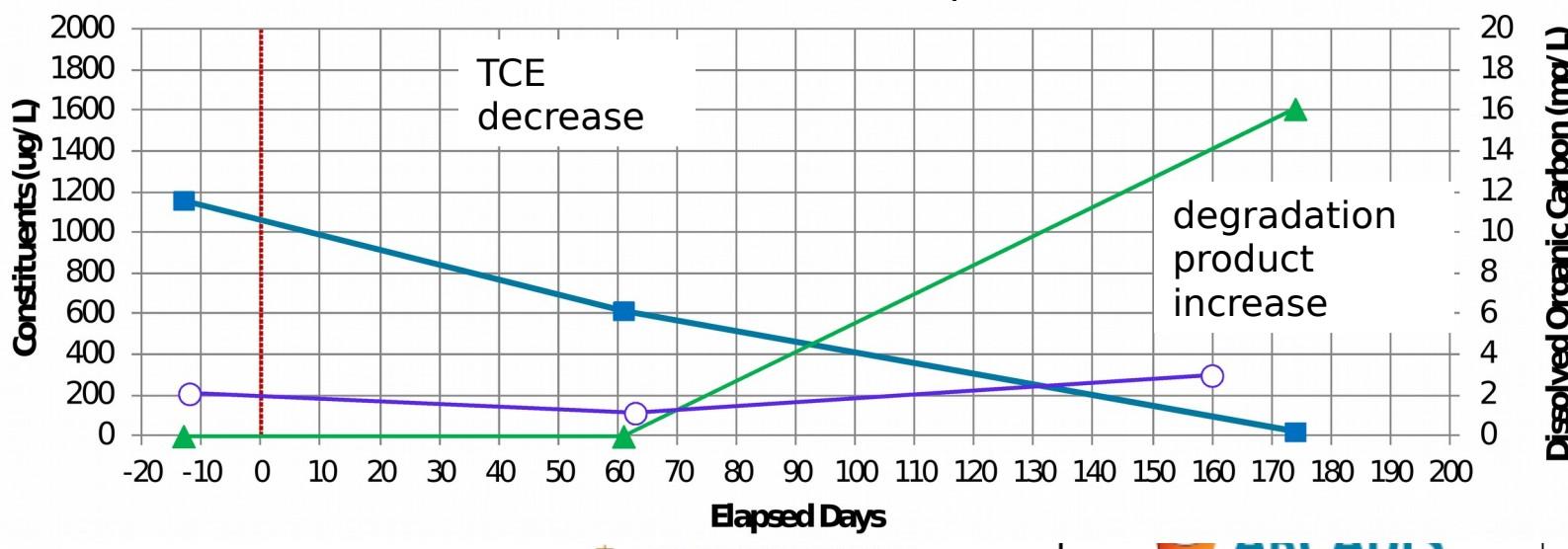
171MW-14B(intermediate)

----- Injection Event

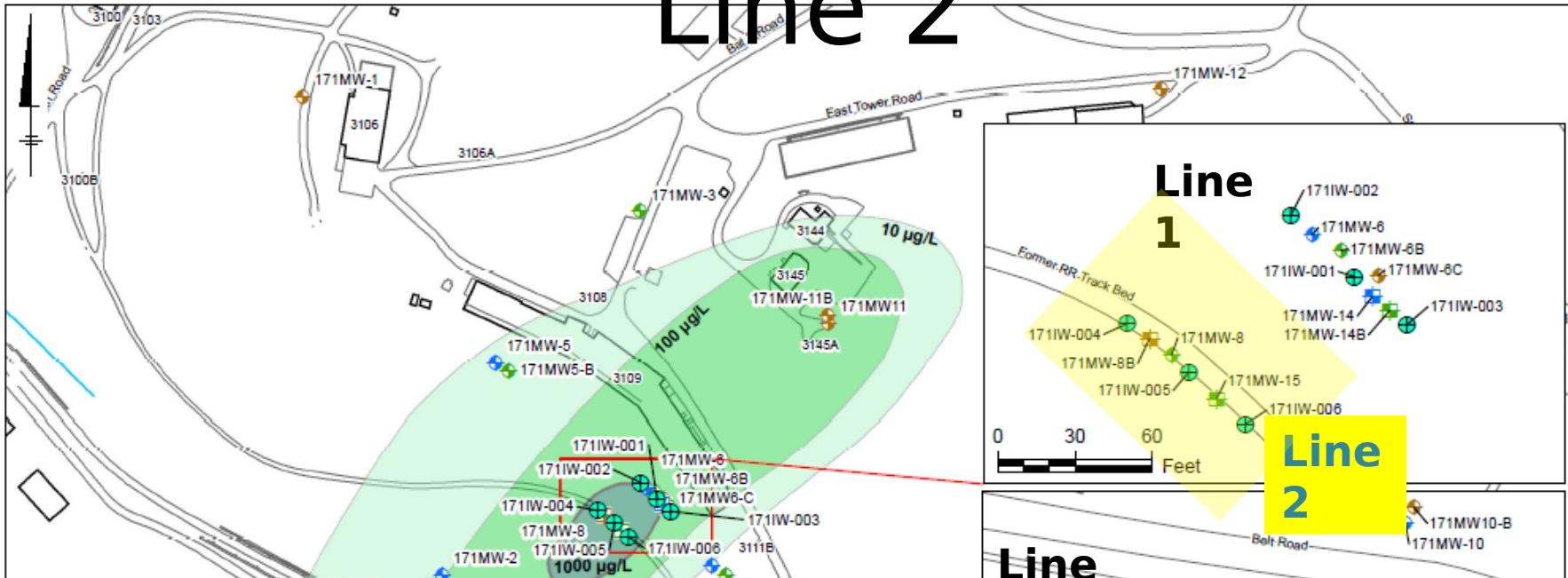
TCE

cis-1,2-DCE

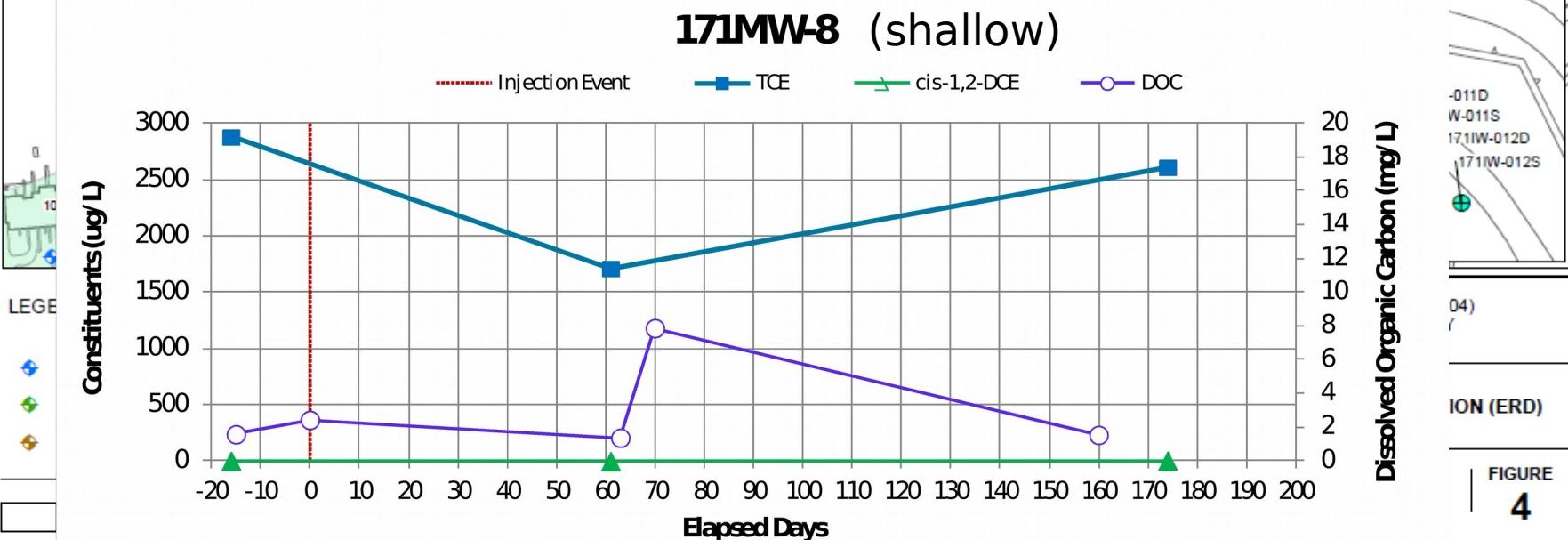
DOC



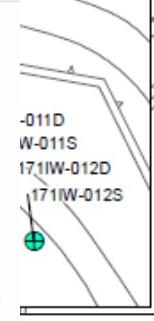
In-Situ Bioremediation - Line 2



171MW-8 (shallow)



Dissolved Organic Carbon (mg/L)

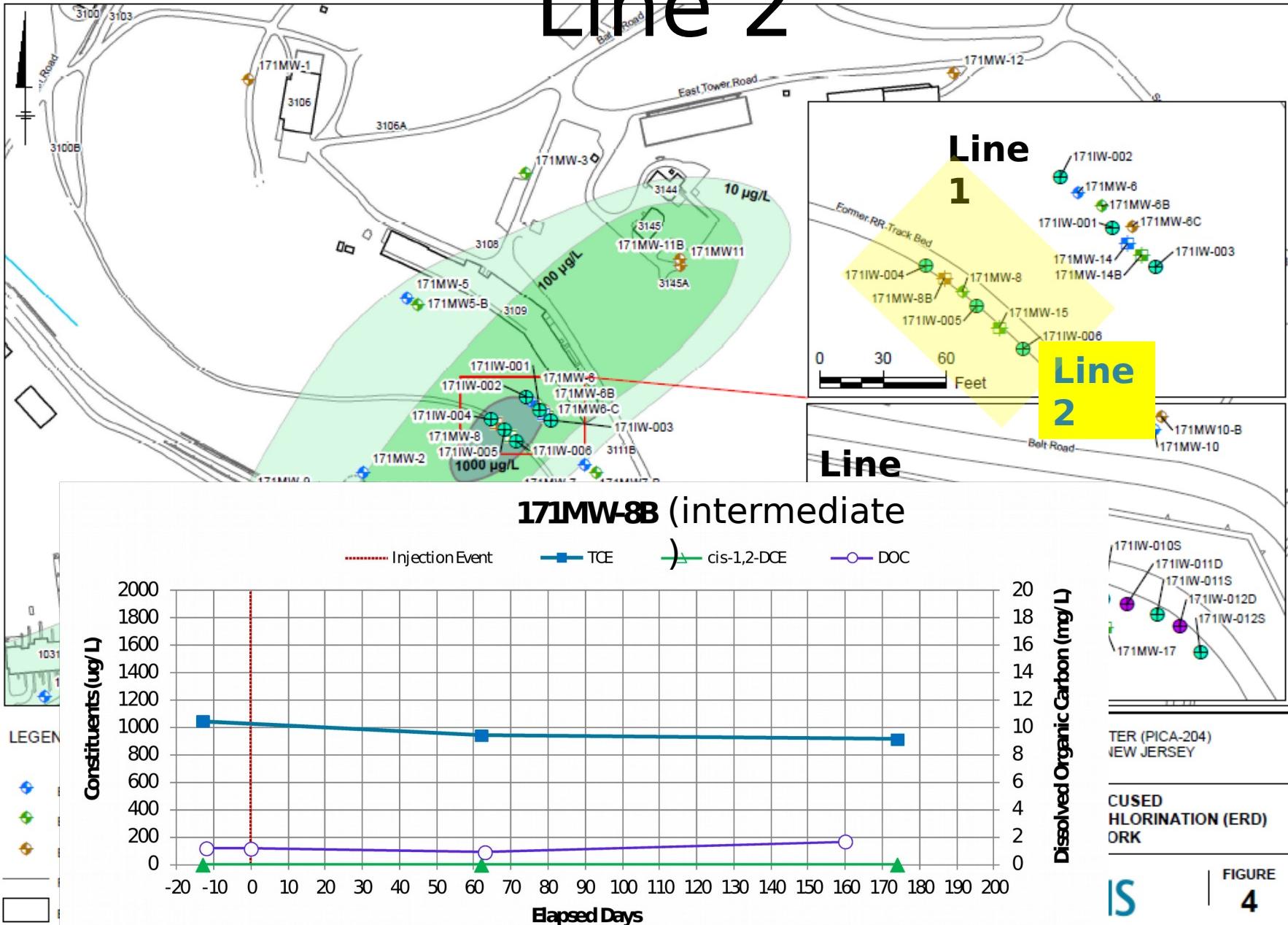


04)

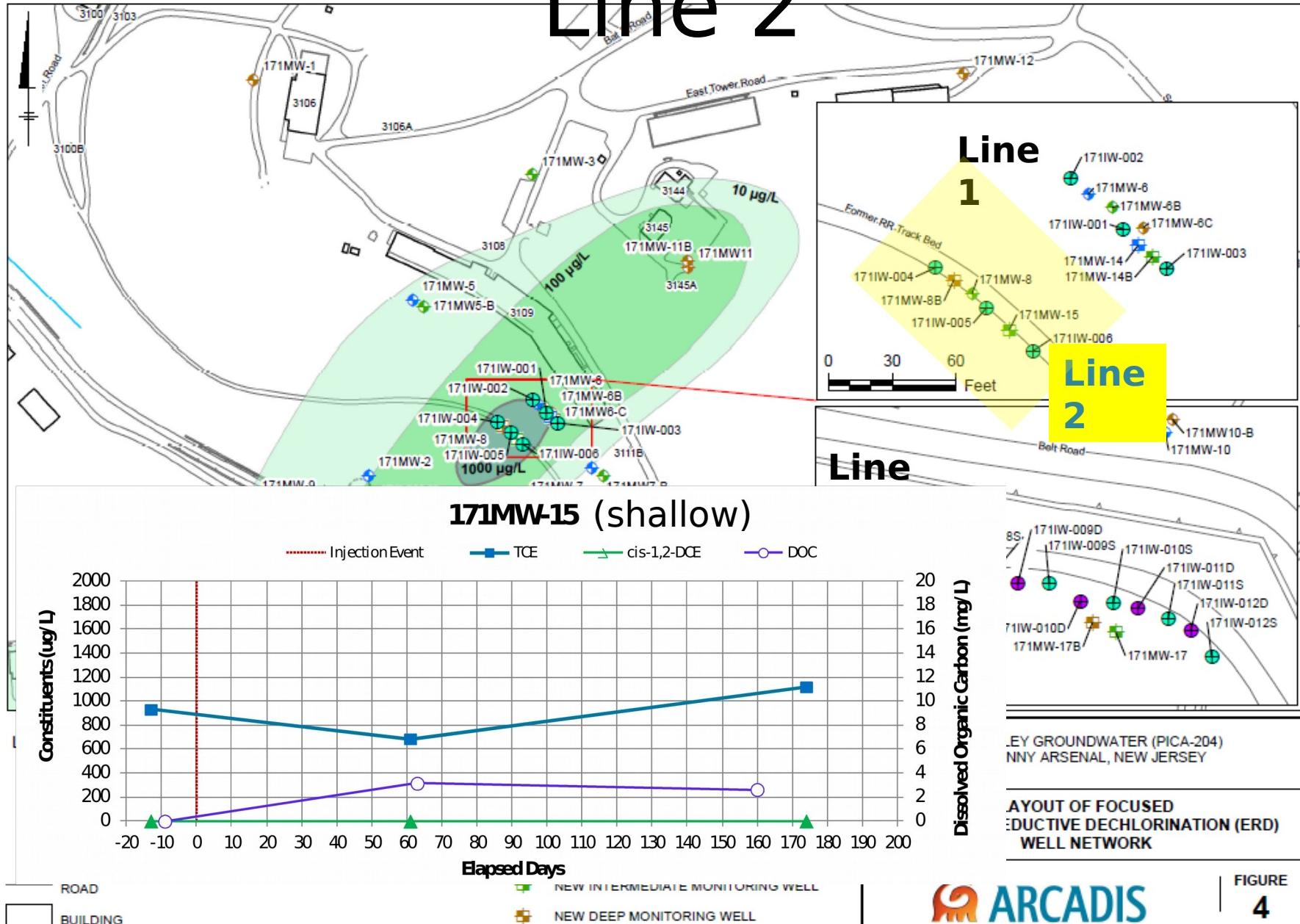
ION (ERD)

FIGURE

In-Situ Bioremediation - Line 2



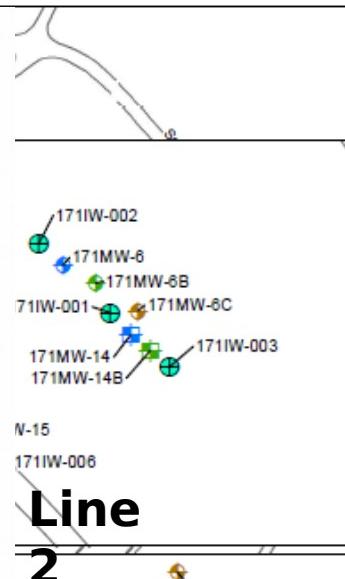
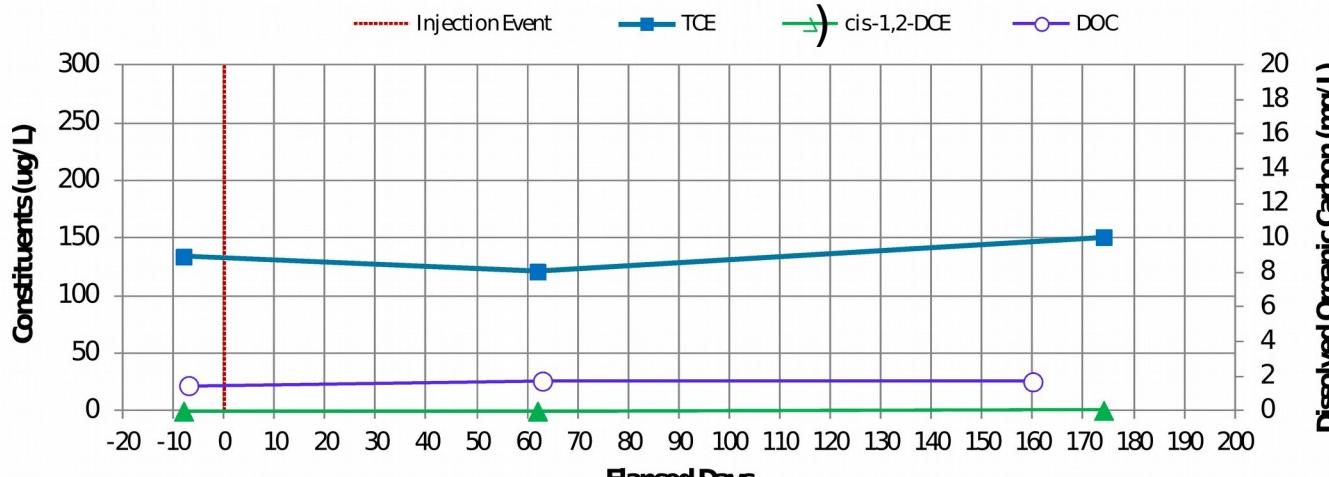
In-Situ Bioremediation - Line 2



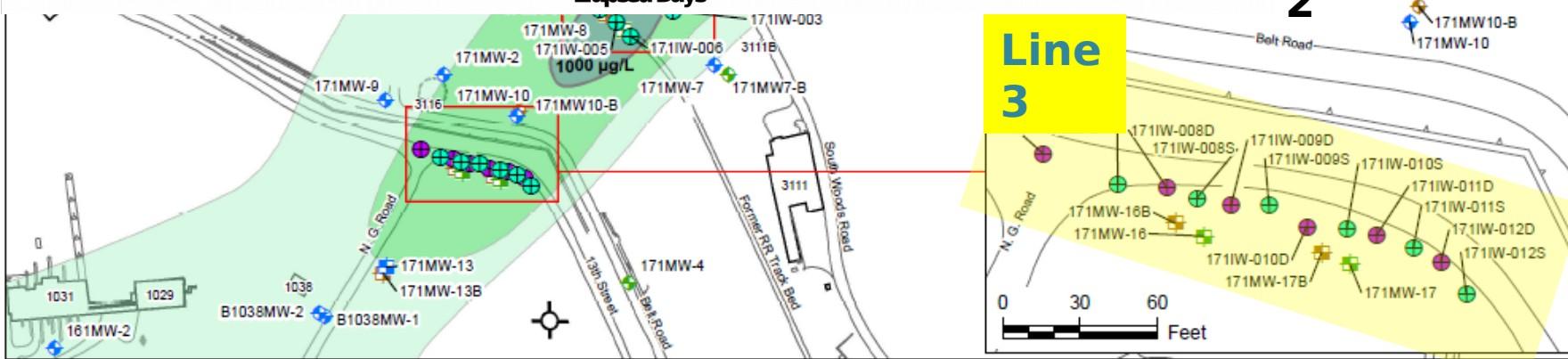
In-Situ Bioremediation -

Line 3

171MW-16 (intermediate)



Line 2



LEGEND:

- ◆ EXISTING SHALLOW BEDROCK WELL, < 65 FT DEPTH BGS
- ◆ EXISTING INTERMEDIATE BEDROCK WELL, 65 - 100 FT DEPTH BGS
- ◆ EXISTING DEEP BEDROCK WELL, > 100 FT DEPTH BGS
- ROAD
- BUILDING
- NEW SHALLOW INJECTION WELL
- NEW DEEP INJECTION WELL
- ◆ NEW SHALLOW MONITORING WELL
- ◆ NEW INTERMEDIATE MONITORING WELL
- ◆ NEW DEEP MONITORING WELL

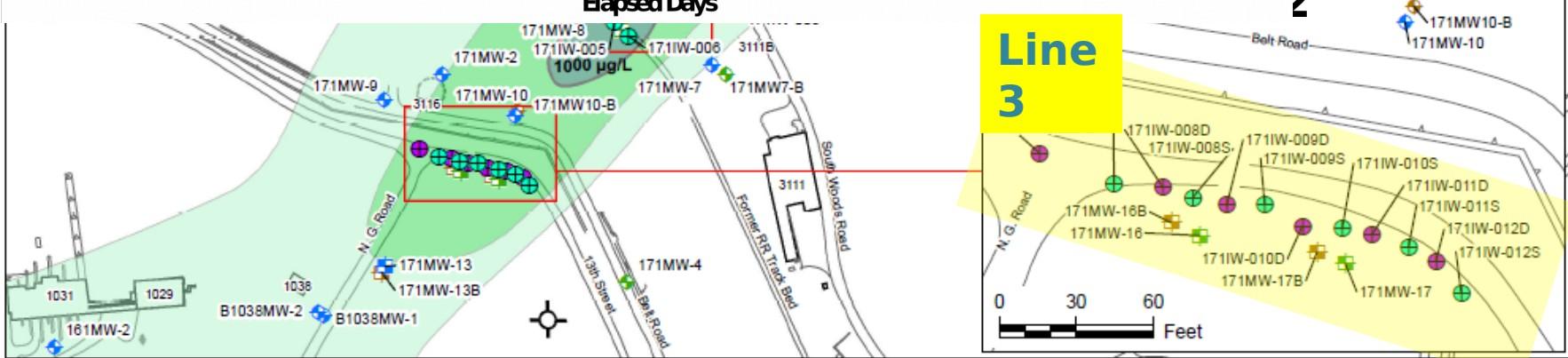
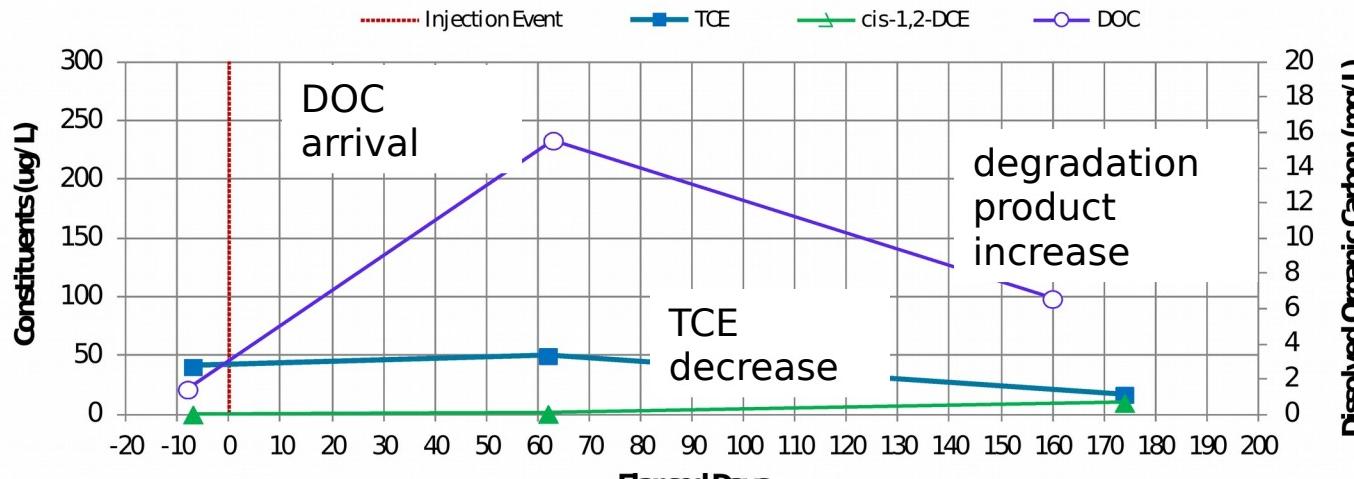
0 230 460 Feet
GRAPHIC SCALE

MID-VALLEY GROUNDWATER (PICA-204)
PICATINNY ARSENAL, NEW JERSEY

LAYOUT OF FOCUSED
ENHANCED REDUCTIVE DECHLORINATION (ERD)
WELL NETWORK

In-Situ Bioremediation - Line 3

171MW-16B (deep)



LEGEND:

- EXISTING SHALLOW BEDROCK WELL, < 65 FT DEPTH BGS
- EXISTING INTERMEDIATE BEDROCK WELL, 65 - 100 FT DEPTH BGS
- EXISTING DEEP BEDROCK WELL, > 100 FT DEPTH BGS
- ROAD
- BUILDING

GRAPHIC SCALE

0 230 460 Feet

- NEW SHALLOW INJECTION WELL
- NEW DEEP INJECTION WELL
- NEW SHALLOW MONITORING WELL
- NEW INTERMEDIATE MONITORING WELL
- NEW DEEP MONITORING WELL

MID-VALLEY GROUNDWATER (PICA-204)
PICATINNY ARSENAL, NEW JERSEY

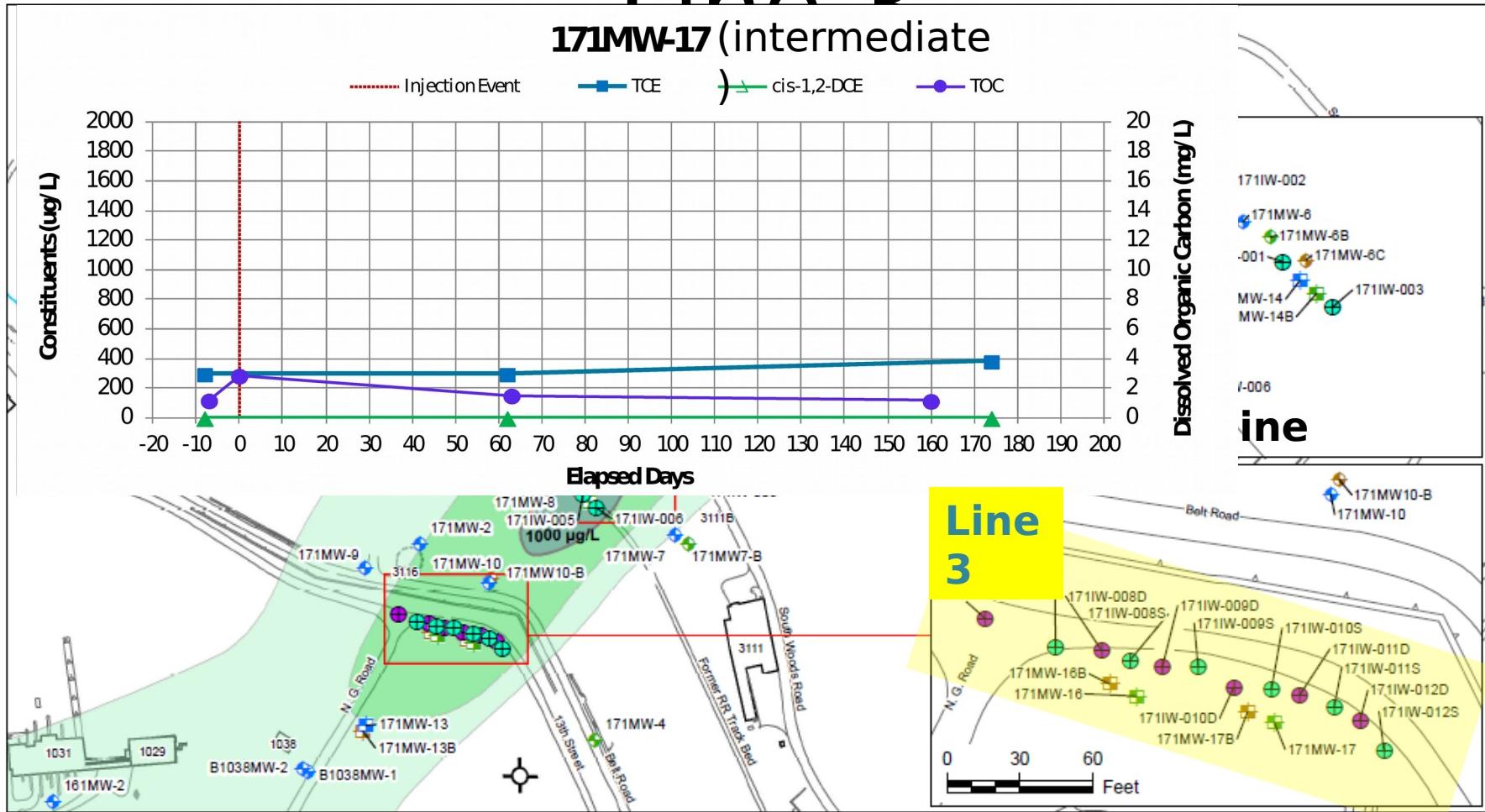
LAYOUT OF FOCUSED ENHANCED REDUCTIVE DECHLORINATION (ERD) WELL NETWORK

FIGURE 4



In-Situ Bioremediation -

Line C



LEGEND:

- ◆ EXISTING SHALLOW BEDROCK WELL, < 65 FT DEPTH BGS
 - ◆ EXISTING INTERMEDIATE BEDROCK WELL, 65 - 100 FT DEPTH BGS
 - ◆ EXISTING DEEP BEDROCK WELL, > 100 FT DEPTH BGS

ROAD

BUILDING

-  NEW SHALLOW INJECTION WELL
 -  NEW DEEP INJECTION WELL
 -  NEW SHALLOW MONITORING WELL
 -  NEW INTERMEDIATE MONITORING WELL
 -  NEW DEEP MONITORING WELL

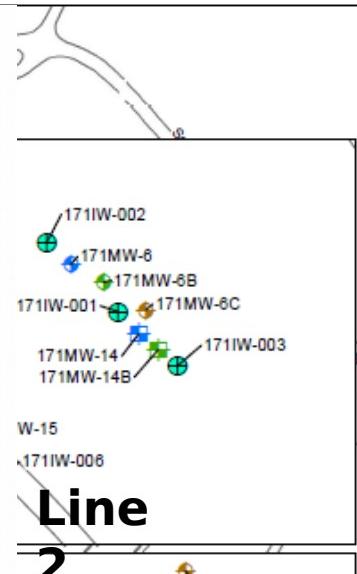
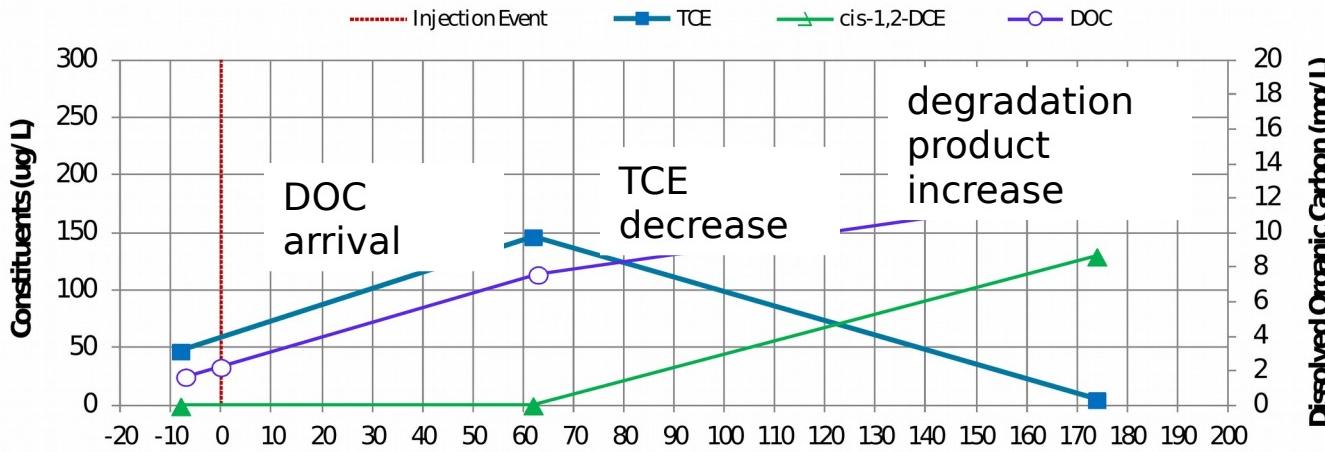
MID-VALLEY GROUNDWATER (PICA-204)
PICATINNY ARSENAL, NEW JERSEY

AYOUT OF FOCUSED ENHANCED REDUCTIVE DECHLORINATION (ERD) WELL NETWORK

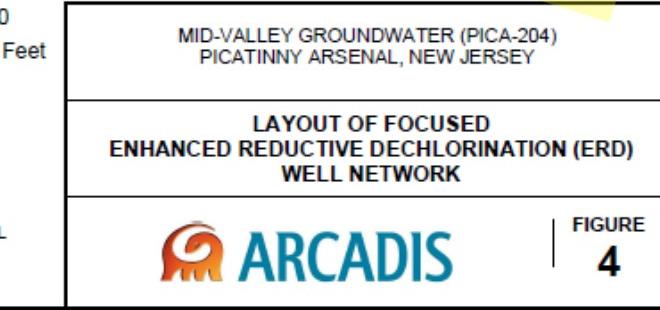
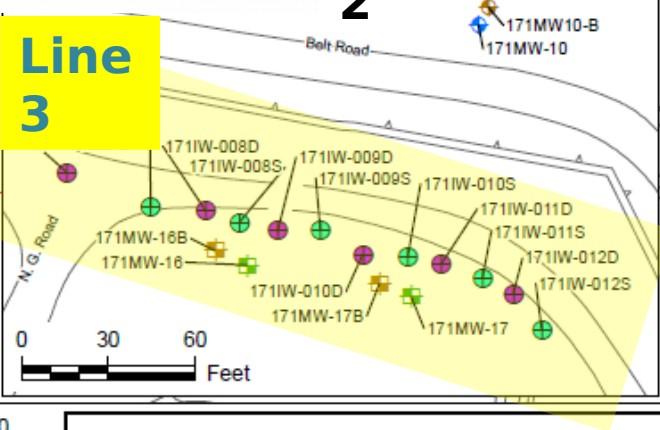
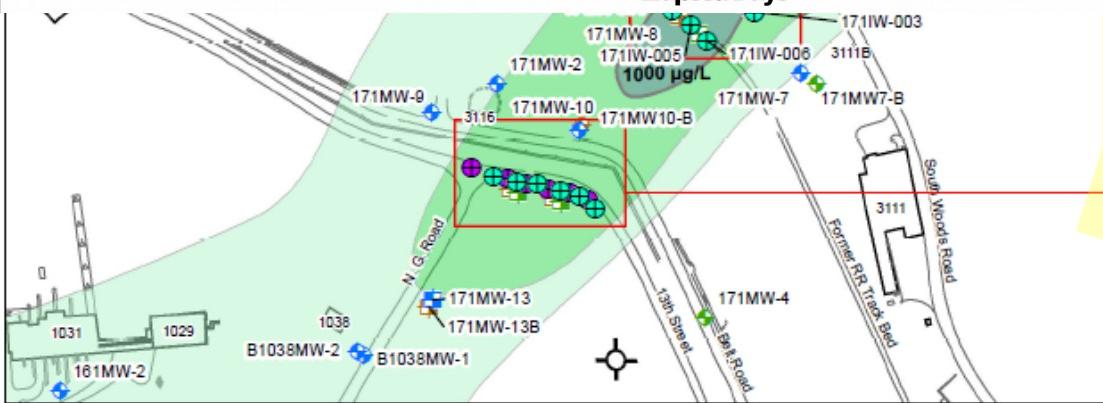
In-Situ Bioremediation -

Line 2

171MW-17B (deep)



**Line
2**



LEGEND:

- Existing Shallow Bedrock Well, < 65 ft Depth BGS
- Existing Intermediate Bedrock Well, 65 - 100 ft Depth BGS
- Existing Deep Bedrock Well, > 100 ft Depth BGS
- Road
- Building
- New Shallow Injection Well
- New Deep Injection Well
- New Shallow Monitoring Well
- New Intermediate Monitoring Well
- New Deep Monitoring Well

0 230 460 Feet

GRAPHIC SCALE



In-Situ Bioremediation Summary

US Army Garrison
Picatinny Arsenal

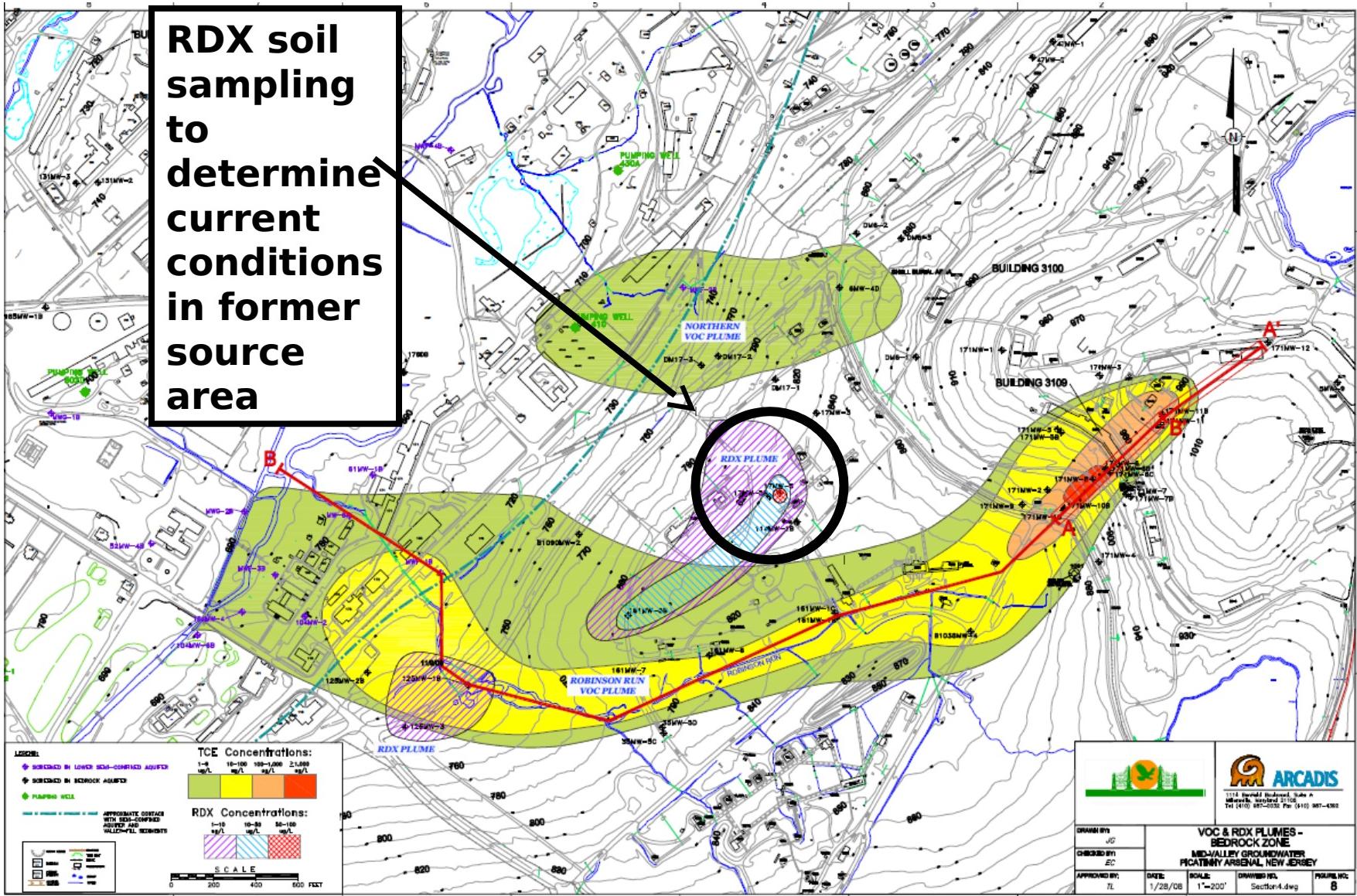
- Early results look favorable
 - Reducing conditions are becoming established.
- TCE decreasing and degrading to cis-1,2-DCE
- Second injection event planned for November to increase carbon loading & accelerate buildup of reducing conditions



Results of RDX Plume Soil Investigation

RDX Soil Removal

RDX soil sampling to determine current conditions in former source area



RDX Soil Investigation – Bldg 1071 Area

- Probable source area for RDX plume (near well 17MW-5)
- Former waste water conveyance area associated with explosives production
- RDX historically detected in some soil samples and targeted removal action was performed in mid-2000s.
- Selected areas for sampling based on previous investigations and historical site features

Site 162 Concrete Catch Basin Area

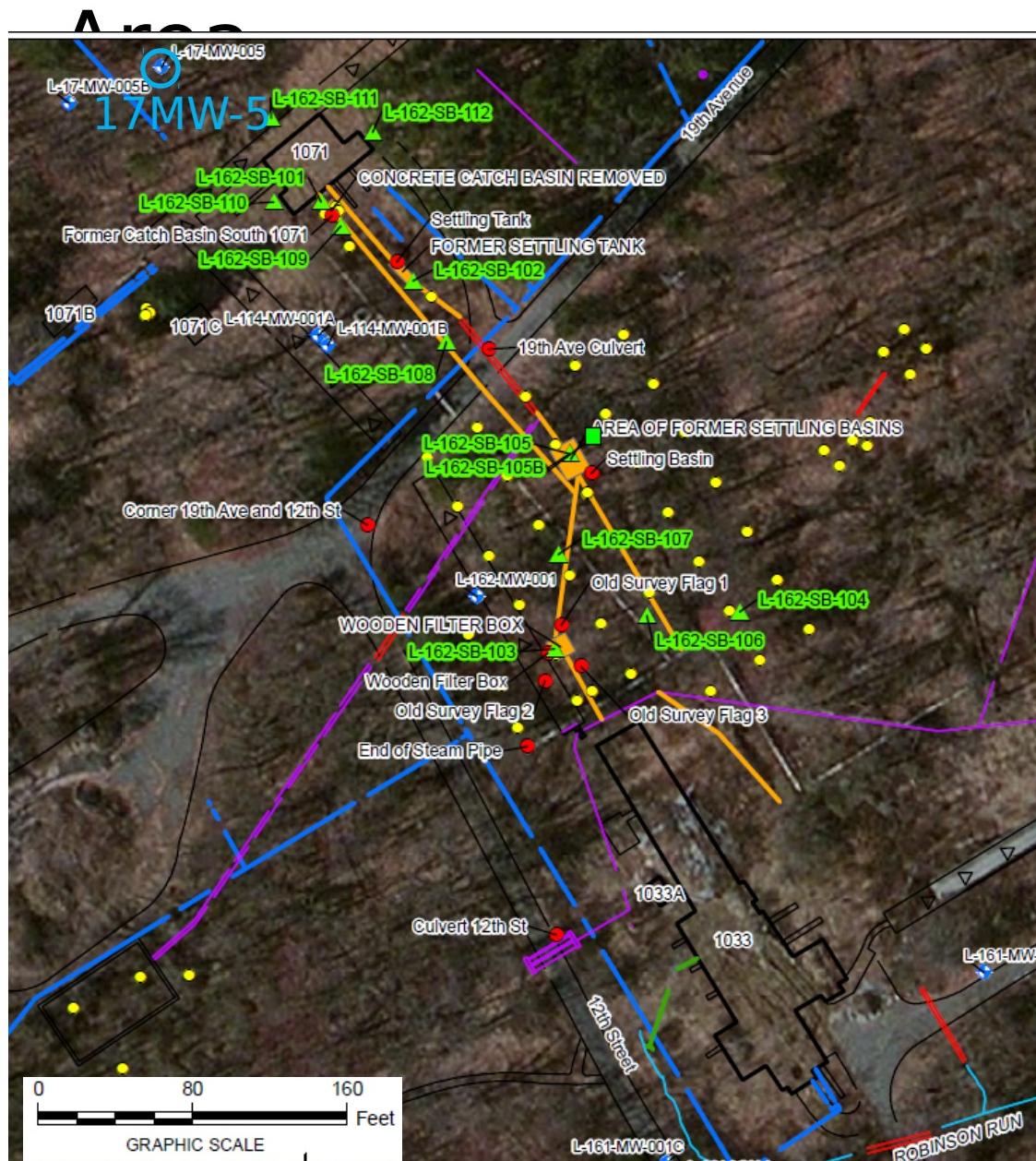
Site 162 Settling Tank Area



RDX Soil Investigation - Bldg 1071

- Installed borings in 12 locations to bedrock or water table & collected samples every 2 ft
- RDX detected at low concentrations in 10 of 68 samples
- Maximum RDX concentration: 20.3 mg/kg at SB-101 [4-4.5 ft bgs]
- Cleanup level is 26 mg/kg

Conclusion:
No removal action





Next Steps



- Good results from EVO injection – perform a second EVO injection in November to increase carbon loading
- Continue performance sampling and MNA sampling for TCE and RDX in groundwater

Thank You